16. Two helicopters searching for the survivors of a shipwreck travel side by side at an altitude of 300 m. After receiving an order over their radios, one of the helicopters begins ascending such that its altitude, in metres, varies according to the equation $A_1(t) = 18t + 300$ where t is the time, in minutes, since the order was given. The second helicopter begins its ascent 4 min later and its altitude varies according to the rule $A_2(t) = 90\sqrt{t - 4} + 300$.

a) At what time will the helicopters be at the same altitude?

b) Both helicopters halt their ascents 25 min after receiving the order. What is the difference in altitude between them?

Helicopters are complex, delicate aircraft with a fairly limited range, requiring highly skilled pilots. Nonetheless, their particular capabilities, such as their maneuverability, make them ideal for a variety of applications: passenger and freight transport; mountain rescue operations; firefighting; farming; pipeline installation; inspection of precipitous terrain; power-line surveillance; etc.

17. Given the function f: IR → IR

$$x \mapsto f(x) = 3\sqrt{x - 2} - 5$$

a) Draw the graphs of f and f^{-1}.

b) State the domain and range of f and f^{-1}.

18. In which quadrant is the graph of f^{-1} located if the graph of f is located entirely in:

a) The 1st quadrant?

b) The 2nd quadrant?

c) The 3rd quadrant?

d) The 4th quadrant?

19. State the rule for the inverse of the following functions:

a) $f(x) = 4\sqrt{-(x - 1)} + 3$

b) $g(x) = -2\sqrt{x + 7} - 10$

c) $h(x) = 4\sqrt{9x + 27} + 6$

d) $i(x) = 4\sqrt{-(x - 2)} - 8$

20. The braking distance and the coefficient of tire friction on the road are variables used to find the speed of an automobile at the moment the driver applies the brakes. The table of values below contains data compiled from tests on an asphalt road:

Braking distance (m)	0	4	11	22	36	44	65
Speed (km/h)	0	30	50	70	90	100	120

a) Plot these points and draw the curve passing through them.

b) Find the function rule for this mathematical model.

c) A police force uses the formula $v = 15.9\sqrt{df}$ where d is the braking distance in metres, and f is the coefficient of friction. What is the coefficient of friction in this example?

21. Given the functions $f(x) = 3\sqrt{x} + 5$ and $g(x) = -\sqrt{x} + 9$, find the rules for the following functions, then graph them:

a) $f + g$

b) $f - g$

22. The functions f and g are defined as $f(x) = 2\sqrt{x} + 3$ and $g(x) = -2\sqrt{x} + 3$.

a) Find the rule for $f \bullet g$.

b) Graph $f \bullet g$.

c) What is the domain of $f \bullet g$?

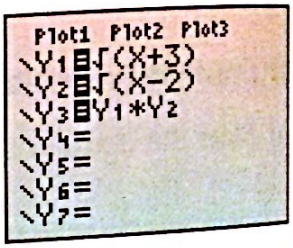
d) What is the range of $f \bullet g$?

23. The value of two automobiles is recorded over a 5-year period. The rules for their depreciation are $V_1 = -6.5\sqrt{x} + 25$ and $V_2 = -5\sqrt{x} + 20$ where x is the number of elapsed years, and V_1 and V_2 are expressed in thousands of dollars.

a) Find the rule for calculating the difference between the values of the two automobile over this period.

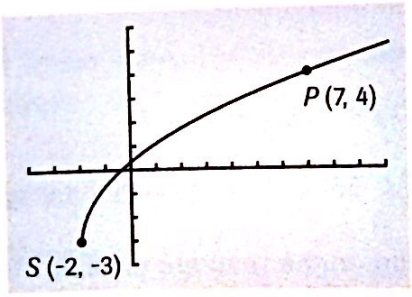
b) What is the difference in their values after 5 years?

24. Two square root functions and their product are entered into a graphing calculator. Is the graph of the product function a ray? Justify your answer.

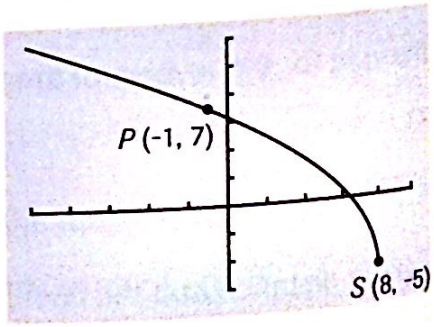


25. Find the rule for each square root function using the coordinates of the vertices V and the coordinates of a point P on its corresponding semi-parabola.

a)



b)



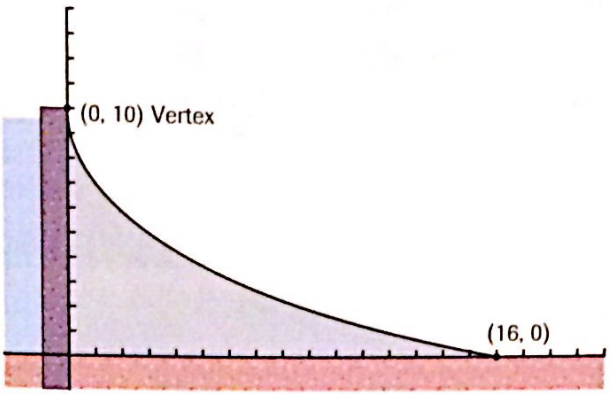
c) $S(-4, -4)$ and $P(0, 0)$

d) $S(2, 3)$ and $P(5, -1)$

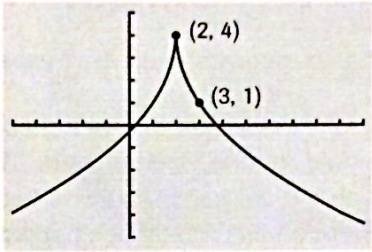
26. When a boat's motor is shut off, the time it takes for the boat to come to a complete sto depends largely on the shape of its hull. The table below lists a boat's speed from the moment its motor is shut off:

Time (s)	0	4	8	12	16	20	24	28
Speed (km/h)	48	32	25	20	16	12	9	6

27. In order to reinforce a dam, an engineer wants to build embankments that are both solid and aesthetically pleasing. The embankments are thus designed to follow the curve of a square root function. Find the function rule for this curve using the data supplied on the right.



28. The letter "i" has been written using two square root functions with symmetric curves. Figure out their rules from the data on the graph.



29. Find all the properties of the following functions:

a) $f(x) = 2\sqrt{x - 2} + 3$

b) $g(x) = 2\sqrt{-x + 3} - 1$

c) $h(x) = -2\sqrt{2x - 2} - 3$

d) $i(x) = -2\sqrt{-(x + 2)} - 5$

THINK TANK

a) What are the possible signs of parameters **a, b, h** and **k** for the square root function:

1) Whose zero and y-intercept are strictly positive?
2) That has no zero or y-intercept?
3) That has a negative maximum?
4) That has a strictly positive maximum?

b) Point (3, 1) is the vertex of a semi-parabola that passes through point (7, 3).

1) Is there only one semi-parabola that satisfies these conditions? Justify your answer.
2) State the corresponding rule(s).